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NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

To:

JOHN & KERNICK
P O Box 3511
Halfway House
Midrand, 1685
AFRIQUE DU SUDDate of mailing
(day/month/year)

10.01.2005

Applicant's or agent's file reference
P15029PC00

IMPORTANT NOTIFICATION

International application No.
PCT/IB 03/04287International filing date (day/month/year)
30.09.2003Priority date (day/month/year)
30.09.2002Applicant
AQUATAN (PTY) LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)



Applicant's or agent's file reference P15029PC00	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB 03/04287	International filing date (day/month/year) 30.09.2003 ✓	Priority date (day/month/year) 30.09.2002 ✓
International Patent Classification (IPC) or both national classification and IPC E02D31/00		
Applicant AQUATAN (PTY) LIMITED et al. ✓		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 10 sheets. ✓

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 20.04.2004 ✓	Date of completion of this report 10.01.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Geiger, H Telephone No. +49 89 2399-2962 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/IB 03/04287**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1, 2, 4-14 as originally filed
3 received on 29.10.2004 with letter of 29.10.2004

Claims, Numbers

1-60 received on 29.10.2004 with letter of 29.10.2004

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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EXAMINATION REPORT**

International application No. PCT/IB 03/04287

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	4-5,10-14,18-19,24-28,30-34,36,37,39-43,49,51-52,54-58
	No: Claims	1-3,6-9,15-17,20-23,59,60
Inventive step (IS)	Yes: Claims	4-5,10-14,18-19,24-28,30-34,36,37,39-43,49,51-52,54-58
	No: Claims	29,35,38,44-48,50,53
Industrial applicability (IA)	Yes: Claims	1-60
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB 03/04287

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. State of the art

1.1 The document **D1**(=US-A-443 9 062) is considered the most relevant state of the art.

2. Novelty / Inventive step - Articles 33(2) and (3) PCT

2.1 The subject matter of claims 1-3, 6-9, 15-17, 20-23, 59, and 60 is anticipated by the state of the art, the application, therefore, fails to fulfill the criteria of novelty as set out in Article 33(2) PCT..

re independent claims 1, 59, and 60:

2.2 **D1** discloses (cf. col. 1, 60 - col. 2, 12; col. 2, 4-7; col. 2, 51-65; col. 3, 49 - col. 4, 24; fig. 3)

- (a) a geotechnical barrier including
- (b) a first barrier layer 18,
- (c) a second barrier 22 layer overlying the first barrier layer and spaced therefrom,
- (d) the first and second barrier layers defining a fluid passageway 44 having an inlet 42 and an outlet 47; and
- (e) fluid displacement means (i.e. pump 46) for displacing a fluid through said fluid passageway from the inlet to the outlet.

2.3 Although it is not intended to keep a *continuous* negative pressure on the fluid passageway, the geotechnical barrier during extracting a probe (cf. **D1**: col. 4, 51 - col. 5, 10) shows all features according to the subject matter of claim 1, which is, therefore, not new.

2.4 For the same reasons, the subject matter of claims 59 and 60 is also not novel in the light of the disclosure of **D1**, cf.: col. 4, 51 - col. 5, 10.

re independent claim 15:

2.3 **D1** further discloses a method for constructing and operating a geotechnical barrier with all features according to the subject matter of claim 15 (cf. col. 1, 60 - col. 2, 12; col. 2, 51-65; col. 3, 49 - col. 4, 24; fig. 3; col. 4, 51 - col. 5, 10).

re independent claims 29 and 44:

2.4 The subject matter of claim 29 only differs from the geotechnical barrier of **D1** (cf. col. 1, 60 - col. 2, 12; col. 2, 4-7; col. 2, 51-65; col. 3, 49 - col. 4, 24, col. 2, 66 - col. 3, 10; fig. 3) in that

- first and second barrier layers are of geosynthetic material.

2.5 For the skilled man, however, it goes without saying to make use of geosynthetics. e.g. when durability of the first and second layer is a concern. The subject matter of claim 29, therefore being not based on inventive activity.

2.6 Claim 44, directed to a method of constructing and operating the geosynthetic barrier of claim 29, is not based on inventive activity, either (cf. item 2.5 above).

re dependent claims 2-3, 6-9, 16-17, 20-23, 35, 38, 45-48, 50, and 53:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB 03/04287

- 2.7 Dependent claims **2-3, 6-9, 16-17, 20-23, 35, 38, 45-48, 50, and 53** do not contain any additional features which, in combination with the features of any claim to which they refer, would lead to subject matter fulfilling the requirements of Article 33(2) or (3) PCT. These additional features are also anticipated by the abovementioned prior art, cf. **D1**: col. 2, 55-58; col. 2, 66- col. 3, 10; col. 2, 4-7; col. 4, 51 - col. 5, 10; fig. 3.

re dependent claims 4-5, 10-14, 18-19, 24-28, 30-34, 36-37, 39-43, 49, 51-52, and 54-58:

- 2.8 The additional features of the above claims are not disclosed or rendered obvious by the available state of the art.

3. Industrial applicability - Article 33(4) PCT

- 3.1 The subject matter of all claims is industrially applicable.

Remarks:

To meet the requirements of Rule 6.3(b) PCT, independent claims should be properly cast in the two part form, with those features which in combination are part of the prior art being placed in the preamble.

Reference signs in parentheses should be inserted in the claims to increase their intelligibility; this applies to both the preamble and the characterising portion (Rule 6.2(b) PCT).

mechanical damage to the GCL. In addition, the Bentonite is often squeezed from the GCL due to loads exerted during the laying (and welding) of the upper geomembrane. For this reason, in many installations the GCL is not hydrated, resulting in a reduction in the reliability and performance of the GCL. Difficulties with hydration of the GCL are magnified where the GCL is located on a slope. In summary, in conventional geotechnical barriers using GCLs there is a problem of the hydration of the GCL. Further, performance of the barrier is improved if the GCL can be re-hydrated, either continuously or at appropriate intervals.

Generally, the layers of low permeability, whether non-synthetic or synthetic, used in the geotechnical barriers described are at least partially permeable, particularly to substances such as volatile organic compounds. These compounds are particularly harmful and should, if possible, be prevented from contaminating the environment in which the waste site is situated. In barriers of the sort described above, volatile organic compounds, toxic liquids and other contaminants penetrating or permeating or diffusing through the upper membrane or layer of the barrier will collect in the space or passageway provided by the drainage layer. If not removed, they may then eventually permeate the under layer. Thus, this fluid passageway acts, to some extent, as a temporary reservoir for volatile gasses and toxic liquids. It would be an advantage to be able to remove these contaminants from the fluid passageway, either on a continuous basis or at appropriate intervals.

In this specification, the word "passageway" shall be given a wide meaning and shall apply to any space providing a fluid flow path, irrespective of its shape. A passageway shall also include a region of high fluid permeability/transmissivity and shall include a drain.

Further, the geosynthetic membranes used in geotechnical barriers are required to be installed, as far as possible, without creases, folds or breaks. To achieve this, it is often necessary to cut and weld the membrane after laying. It would be an advantage to be able to treat the membrane so that it

CLAIMS

1. A geotechnical barrier, the barrier including
a first barrier layer;
5 a second barrier layer overlying the first barrier layer and spaced therefrom, the first and second barrier layers defining, at least in part, a fluid passageway having an inlet and an outlet; and
fluid displacement means connected to the outlet and operable to provide a negative pressure at the outlet with respect to the pressure at the inlet, thereby to displace a fluid through said fluid passageway from the inlet to the outlet.
10
2. A geotechnical barrier as claimed in claim 1, which includes spacing means for spacing the first barrier layer from the second barrier layer.
15
3. A geotechnical barrier as claimed in claim 2, in which the spacing means comprises a drainage layer of at least one non-synthetic material.
4. A geotechnical barrier as claimed in claim 2, in which the spacing means is of a geosynthetic material.
20
5. A geotechnical barrier as claimed in claim 4, in which the spacing means comprises a cusped membrane of a plastics material.
- 25 6. A geotechnical barrier as claimed in any one of the preceding claims, in which the first and second barrier layers comprise non-synthetic geotechnical materials.
7. A geotechnical barrier as claimed in any one of claims 1 to 5, in which the first and second barrier layers comprise geosynthetic materials.
30

8. A geotechnical barrier as claimed in claim 7, in which at least one of the first and second barrier layers is a geocomposite barrier layer.

5 9. A geotechnical barrier as claimed in claim 8, in which the geocomposite layer comprises a geocomposite clay liner, the clay layer thereof being in fluid communication with the fluid passageway.

10 10. A geotechnical barrier as claimed in any one of the preceding claims, in which the fluid comprises air.

11. A geotechnical barrier as claimed in any one of claims 1 to 9, which includes entrainment means connected at the inlet of the fluid passageway for entraining a substance into an air stream provided at the inlet, to provide a fluid for displacement through the fluid passageway comprising a mixture of air and the said substance.

12. A geotechnical barrier as claimed in claim 11, in which the substance is water.

20 13. A geotechnical barrier as claimed in any one of the preceding claims, which includes a temperature control means for controlling the temperature of the fluid introduced at the inlet of the fluid passageway.

25 14. A geotechnical barrier as claimed in any one of the preceding claims, in which the outlet is connected to a disposal means for disposing of the fluid and any contaminants entrained therein extracted at the outlet.

30 15. A method for constructing and operating a geotechnical barrier, the method including
providing a first barrier layer;

providing a second barrier layer overlying the first barrier layer and spaced therefrom, the first and second barrier layers defining, at least in part, a fluid passageway having an inlet and an outlet; and

providing a negative pressure at the outlet with respect to the inlet, thereby displacing a fluid through said fluid passageway from the inlet to the outlet.

16. A method as claimed in claim 15, which includes providing spacing means for spacing the first barrier layer from the second barrier layer.

17. A method as claimed in claim 16, in which the spacing means comprises a drainage layer of at least one non-synthetic material.

18. A method as claimed in claim 17, in which the spacing means is of a geosynthetic material.

19. A method as claimed in claim 18, in which the spacing means comprises a cusped membrane of a plastics material.

20. A method as claimed in any one of claims 15 to 19, in which the first and second barrier layers comprise non-synthetic geotechnical materials.

21. A method as claimed in any one of claims 15 to 19, in which the first and second barrier layers comprise geosynthetic materials.

22. A method as claimed in claim 21, in which at least one of the first and second barrier layers is a geocomposite barrier layer.

23. A method as claimed in claim 22, in which the geocomposite layer comprises a geocomposite clay liner, the clay layer thereof being in fluid communication with the fluid passageway.

24. A method as claimed in any one of claims 15 to 23, in which the fluid comprises air.
- 5 25. A method as claimed in any one of claims 15 to 24, which includes entraining a substance into an air stream provided at the inlet, to provide a fluid for displacement through the fluid flow passageway comprising a mixture of air and the said substance.
- 10 26. A method as claimed in claim 25, in which the substance is water.
27. A method as claimed in any one of claims 15 to 26, which includes controlling the temperature of the fluid introduced at the inlet of the fluid passageway.
- 15 28. A method as claimed in any one of claims 15 to 27, which includes the step of disposing of the fluid and any contaminants entrained therein extracted at the outlet.
- 20 29. A geosynthetic barrier including
a first geosynthetic barrier layer;
a second geosynthetic barrier layer;
spacer means intermediate the first and second barrier layers to
space the said barrier layers apart, the first and second barrier layers
thereby defining a fluid passageway and the fluid passageway having an
25 inlet and an outlet; and
fluid displacement means for displacing a fluid through said fluid
passageway from the inlet to the outlet.
- 30 30. A geosynthetic barrier as claimed in claim 29, in which the first barrier layer comprises a geosynthetic membrane.

31. A geosynthetic barrier as claimed in claim 30, in which the second barrier layer comprises a geosynthetic membrane.
- 5 32. A geosynthetic barrier as claimed in claim 30, in which the second barrier layer comprises a geocomposite clay liner comprising a second geosynthetic membrane and a clay liner, the clay liner being positioned intermediate the first and second geosynthetic membranes and the spacer means being positioned intermediate the first membrane and the clay liner to space the said membranes apart, thereby defining the fluid passageway
10 between the first membrane and the clay liner.
33. A geosynthetic barrier as claimed in claim 31 or claim 32, in which the second geosynthetic membrane overlies the first geosynthetic membrane.
- 15 34. A geosynthetic barrier as claimed in claim 33, in which the first and second geosynthetic membranes are peripherally sealed to each other.
- 20 35. A geosynthetic barrier as claimed in any one of claims 29 to 34, in which the spacing means comprises a drainage layer of at least one non-synthetic material.
36. A geosynthetic barrier as claimed in any one of claims 29 to 34, in which the spacing means is of a geosynthetic material.
- 25 37. A geosynthetic barrier as claimed in claim 36, in which the spacing means comprises a cusped membrane of a plastics material.
- 30 38. A geosynthetic barrier as claimed in any one of claims 29 to 37, in which the fluid displacement means is connected to the outlet of the fluid passageway and is operable to provide a negative pressure at the outlet

with respect to the pressure at the inlet, thereby to displace the fluid through said fluid passageway from the inlet to the outlet.

- 5 39. A geosynthetic barrier as claimed in any one of claims 29 to 38, in which the fluid comprises air.
- 10 40. A geosynthetic barrier as claimed in any one of claims 29 to 39, which includes entrainment means connected at the inlet of the fluid passageway for entraining a substance into an air stream provided at the inlet, to provide a fluid for displacement through the fluid passageway comprising a mixture of air and the said substance.
- 15 41. A geosynthetic barrier as claimed in claim 40, in which the substance is water.
- 20 42. A geosynthetic barrier as claimed in any one of claims 29 to 41, which includes a temperature control means for controlling the temperature of the fluid introduced at the inlet of the fluid passageway.
- 25 43. A geosynthetic barrier as claimed in any one of claims 29 to 42, in which the outlet is connected to a disposal means for disposing of the fluid and any contaminants entrained therein extracted at the outlet.
- 30 44. A method for constructing and operating a geosynthetic barrier, the method including
providing a first geosynthetic barrier layer;
providing a second geosynthetic barrier layer;
providing spacer means intermediate the first and second barrier layers to space the said barrier layers apart, the first and second barrier layers thereby defining a fluid passageway and the fluid passageway having an inlet and an outlet; and

displacing a fluid through said fluid passageway from the inlet to the outlet.

- 5 45. A method as claimed in claim 44, in which the first barrier layer comprises a geosynthetic membrane.
46. A method as claimed in claim 45, in which the second barrier layer comprises a geosynthetic membrane.
- 10 47. A method as claimed in claim 45, in which the second barrier layer comprises a geocomposite clay liner comprising a second geosynthetic membrane and a clay liner, the clay liner being positioned intermediate the first and second geosynthetic membranes and the spacer means being positioned intermediate the first membrane and the clay liner to space the
- 15 said membranes apart, thereby defining the fluid passageway between the first membrane and the clay liner.
48. A method as claimed in claim 46 or claim 47, in which the second geosynthetic membrane overlies the first geosynthetic membrane.
- 20 49. A method as claimed in claim 48, in which the first and second geosynthetic membranes are peripherally sealed to each other.
50. A method as claimed in any one of claims 44 to 49, in which the spacing means comprises a drainage layer of at least one non-synthetic material.
- 25 51. A method as claimed in any one of claims 44 to 49, in which the spacing means is of a geosynthetic material.
- 30 52. A method as claimed in claim 51, in which the spacing means comprises a cusped membrane of a plastics material.

53. A method as claimed in any one of claims 44 to 52, in which the fluid is displaced by means of a fluid displacement means connected to the outlet of the fluid passageway, the fluid displacement means being operable to provide a negative pressure at the outlet with respect to the pressure at the inlet, thereby to displace the fluid through said fluid passageway from the inlet to the outlet.
54. A method as claimed in any one of claims 44 to 53, in which the fluid comprises air.
55. A method as claimed in any one of claims 44 to 54, which includes the step of entraining a substance into an air stream provided at the inlet, to provide the fluid for displacement through the fluid passageway comprising a mixture of air and the said substance.
56. A method as claimed in claim 55, in which the substance is water.
57. A method as claimed in any one of claims 44 to 56, which includes the step of controlling the temperature of the fluid introduced at the inlet of the fluid passageway.
58. A method as claimed in any one of claims 44 to 57, which includes the step of disposing of the fluid and any contaminants entrained therein extracted at the outlet.
59. A method for flushing contaminants from a geotechnical barrier comprising at least two barrier layers and having a fluid passageway defined therebetween, the method including displacing a fluid through said fluid passageway to entrain contaminants that have penetrated one of the barrier layers in a fluid flowstream.

- 5 60. A method for hydrating a clay liner of a geotechnical barrier comprising first and second barrier layers one of which includes a clay liner, the method including displacing a hydrating fluid through a fluid passageway defined between the clay liner and the other of the barrier layers.